Yolo Bypass Wildlife Area Habitat and Drainage Improvements Project
Consistency with Delta Plan Guidelines for the Use of Best Available Science

Project Description and Purpose

Landscape Setting: The Yolo Bypass Wildlife Area Habitat and Drainage Improvements Project site is located within the Yolo Bypass and is within the Yolo Bypass Wildlife Area (YBWA). The project site is comprised of very flat terrain with rice fields, emergent wetland, native grasslands, ruderal upland and associated ditches, utilities and infrastructure. Two-hundred-eighty terrestrial vertebrate species are known to use the Yolo Bypass Wildlife Area at some point during their annual life cycles, over 95 of which are known to breed in the Yolo Bypass Wildlife Area. The Yolo Bypass Wildlife Area also provides suitable habitat for 23 additional species that may occur on site but have not yet been observed there.

The Yolo Bypass Wildlife Area is also known to support 38 special-status wildlife species, and many more are locally rare or have specialized habitat requirements that the Wildlife Area provides. The Wildlife Area also provides seasonal or permanent aquatic habitat for 44 species of fish, 8 of which are special-status species. Hundreds of invertebrate species also inhabit the Wildlife Area, including five special status invertebrates. Common vegetation communities found within the Yolo Bypass Wildlife Area include seasonal and permanent wetlands, annual grasslands, riparian scrub and woodlands, vernal pools and swales, and row crop-seasonal wetlands.

The Yolo Bypass is an engineered floodway; managed wetlands in the Yolo Bypass Wildlife Area are now enclosed by levees and berms, and flooded with water from irrigation conveyance systems. Whereas natural wetland hydrology was very dynamic, flooding cycles now used for wetlands can be predictable through strategic and innovative management. Permanent wetlands are flooded year round. They are generally relatively deep (~4 feet) and constructed with islands and shallow underwater shelves. Seasonal wetlands are drained April 1st and flooded September 1st.

The management of productive wetland habitat requires dynamic water management, as well as periodic soil and vegetation disturbances. Adequate water conveyance systems are essential for meeting water management objectives, thus pumps, delivery ditches, water control structures, and drainage systems must be maintained in functional condition.

Wildlife Benefits: The Project will increase the quantity of habitat available for waterfowl and other species by providing a water supply to 220 additional acres of wetlands. The project will improve the *quality* of habitat on 1,250 acres of existing seasonal and semi-permanent wetlands by improving the ability of managers to fill and drain wetlands, therefore allowing managers to increase consistency in flood depth to provide more reliable habitat for waterfowl nesting and feeding throughout the year, decrease noxious weeds, increase vegetation desirable for waterfowl (such as swamp timothy, watergrass, and smart weed), and control avian diseases.

Benefits to Agriculture in the Delta: The Project will improve agricultural sustainability by allowing farmers to drain and fill their fields more quickly on 540 acres. Farmers will therefore be able to plant and harvest earlier than may otherwise be possible, especially in years in which the Yolo Bypass is

inundated in late spring, as well as improve management of agricultural land for habitat. Spring inundation increases the chances of a late plant date, which in turn increases the chances of harvest delay and potential yield impacts from rain and other weather factors. Project drainage improvements will also allow farmers to resolve water management and wetlands conflicts resulting from circumstances in which agricultural operations must use canals to fill fields but wetlands may need to drain.

Row Crop-Seasonal Wetland: Row crop-seasonal wetland communities are found across the northern and central portions of the Yolo Bypass Wildlife Area (e.g., Causeway Ranch and 1,000 Acre units). These are generally agricultural plant communities comprising various annual row crops in the spring and summer months. The primary crop is rice but a variety of other crops are produced including grains (e.g., corn, millet, and milo [grain sorghum]). The fields are typically managed as flooded open water habitat in the winter months. During the winter months few, if any, plants are likely encountered except for residual stubble and other by-products remaining after crop harvesting. During the summer months, non-crop plants are limited primarily to agricultural weeds. The project will improve the *quality* of habitat on seasonal and semi-permanent wetlands by improving the ability of managers to fill and drain cropped fields. Seasonal wetlands can be flooded to shallow depths as a shorebird habitat. These habitats can then be managed for plants beneficial to wildlife such as fat hen (atriplex), smart weed, swamp timothy and swamp grass. Consistency in flood depth also provides more reliable habitat for waterfowl nesting and feeding throughout the year, helps to decrease noxious weeds, and aids in control of avian diseases.

Background: Consistency with Best Science and Conceptual Models

Wetlands within the Yolo Bypass Wildlife Area typically are managed as moist soil wetlands. Each wetland unit is defined by is containment berm and generally has water control structure(s) (WCS) that facilitate hydrologic ingress and egress. Moist-Soil Management (Seasonally Flooded Impoundments) is used to provide moist soil conditions during the growing season to promote the natural production of beneficial plants. Seeds produced by these plants often attract and concentrate waterfowl, water birds, shorebirds and other wetland wildlife species. The decomposing vegetative parts of moist-soil plants also provide substrata for invertebrates, which are critical food for many wetland wildlife. Factors that determine the success of moist-soil management include: the timing and rate of the dewatering; soil disturbance and the stages of plant succession; and the timing and rate of re- flooding. Best success is achieved when water levels can be controlled, although good results can be obtained under natural conditions when artificial draining and flooding are not possible.

Water level manipulations are one of the most effective tools in wetland management, provided fluctuations are well-timed and controlled. Manipulations are most effective on sites with (1) a dependable water supply, (2) an elevation gradient that permits complete water coverage at desired depths over a majority of the site, and (3) the proper type of water control structures that enable water to be supplied, distributed, and discharged effectively at desired rates. The size and location of structures are important, but timing, speed, and duration of drawdowns and flooding also have important effects on plant composition, plant production, and avian use (Fredrickson). “Robust marsh

vegetation serves as a nutrient pump within wetlands and can influence water chemistry and primary productivity. All of these functions are integral values of wetlands that are important considerations beyond the provision of seeds for waterfowl."

Floodplain inundation of managed wetlands and agricultural units may also provide benefits to organisms downstream in the brackish portion of the Delta (i.e., estuary). At the base of the estuarine food web, phytoplankton are responsible for most of the primary production in the estuary (Jassby et al. 1996). To the detriment of the organisms dependent on phytoplankton, there has been a major long-term decline in phytoplankton biomass in the estuary as a result of multiple factors including introduction of new benthic grazers (i.e., Asian clam) (Alpine and Cloern 1992), water exports and low outflow (Jassby et al. 1995), and climate change (Lehman 2000). Modeling studies by Jassby and Cloern (2000) suggest that phytoplankton produced in the Yolo Bypass may be an important source of organic carbon to the Estuary, at least during flood events. Moreover, Yolo Bypass is likely also a major pathway for detrital material, an important additional source of organic carbon to the food web of the phytoplankton-deficient Estuary. This conclusion is supported by Schemel et al. (1996), who found that the Yolo Bypass is the major pathway for organic matter to the Estuary in wet years. (LMP 2008) The conceptual model utilized for habitat management and the foundation of which restoration efforts are based on, is graphically provide in Figure 9 of the publication "*Upper Mississippi Valley Wetlands – Refuges and Moist-soil Impoundments*" by Frederic Reid, James Kelly, and Scott Taylor. The publication is located on page 181 of *Habitat Management for Migrating and Wintering Waterfowl in North America* produced by Loren Smith, Roger Pederson and Richard Kaminski 1989. By increasing the management capabilities related to flood up and draw down rates, managed seasonal wetlands can produce greater germination density and abundance of seed yield, limit mosquito production, and increase downstream forage and production within the estuary.

An analysis of the "four rivers index," which combines hydrologic data for the Sacramento, American, Yuba, and Feather River systems to establish an annual indicator of water availability in the Sacramento Basin, was used to determine if climate change was responsible for the recent extreme hydrologic trends (Yolo Basin Foundation 2001). This analysis involves the correction of flows on the Sacramento, American, Yuba, and Feather rivers to account for changes in storage, diversion, and evaporation in reservoirs. Exhibit 3.4-5 of the Yolo Basin Wildlife area Land Management Plan, displays the corrected runoff for the 1906–1999 water years. No long term trends were observed, but statistical analysis revealed that runoff variability has been greater in the last 30 years than the 30 years preceding (Dettinger et al. 1995). (YBWA LMP 2008)

Although these results suggest that several habitat measures may be better for young salmon in the Yolo Bypass, floodplain habitat carries stranding risks. The Yolo Bypass floodplain has been graded for agriculture using laser leveling technology, resulting in an exceptionally well drained topography. Observations indicate that highly efficient drainage as proposed by this project may promote successful emigration of young salmon (Sommer et al. 2003). Sommer et al. (2001) examined this issue by doing paired releases of juvenile coded-wire-tagged salmon in the Yolo Bypass and

Sacramento River to obtain comparative survival data for fish migrating through each habitat type.

Relevance of the Project to the Delta Science Plan

Infrastructure improvements in this project will enable water management to be consistent with measures identified in the Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan. This fish passage plan is identified within the Delta Science Plan.

The project is consistent with Recommendations ER-R2, DR-R10, DR-R14 included in the Delta Plan. ER-R2 Prioritize and Implement Projects that Restore Delta Habitat: The project is located in a Priority Habitat Restoration Area.

Recommendation DR-R10 in the Delta Plan encourages Wildlife-friendly Farming. Drainage infrastructure and habitat improvements proposed in this project simultaneously produce both environmental and agricultural benefits.

Recommendation DR-R14 in the Delta Plan enhances Nature-based Recreation. Working landscape enhancements in the YBWA will increase public access, thus expanding nature-based recreation opportunities.

The project helps implement two of the Delta Plan goals. #1 Make conservation a California way of life. Installation of new water-efficient infrastructure and other agricultural sustainability improvements will promote conservation and efficiency. #3 Achieve the co-equal goals for the Delta. YBWA infrastructure improvements will create new habitat and improve management of existing habitant in the YBWA.

Transparency and openness: The YBWA Drainage Project has been designed to contribute to transparent and collaborative science in the Delta as envisioned by the Delta Science Program. The Project has been included as one of six early implementation projects identified by the Yolo Bypass Stakeholders Group; which focused on identifying multi-objective, habitat restoration projects that can improve ecosystem functions for listed fish species in the Yolo Bypass. In addition to major landowners in the Yolo Bypass, this group includes representatives from Yolo County, the Sacramento Area Flood Control Agency (SAFCA), YBF, Reclamation District 2068 (RD 2068), Cal Trout, and Metropolitan Water District of Southern California (MWD). Through this engagement, MWD is contributing nearly $101,281 toward the project's design costs. The Project is also included in the Lower Sacramento/Delta North Regional Flood Management Plan developed by a coalition of local agencies including Solano County, Yolo County, West Sacramento Flood Control Agency, SAFCA, Solano County Water Agency, and RD 2068. The project as proposed will provide habitat benefits at a regional scale by increasing functionality of existing wetlands, providing new water efficiencies within the Yolo Bypass and new infrastructure to create new habitat opportunities for terrestrial and aquatic species. In addition, wetlands provide water-quality benefits and flood attenuation benefits.

The Project was originally conceived as one of 12 projects identified in the Yolo Bypass Drainage and Water Infrastructure Improvement Study prepared by Yolo County in April 2014. This study included extensive interviews with landowners, farmers, local government representatives, water managers, wetland managers, and non-governmental organizations (NGOs) with extensive knowledge of the Yolo Bypass. The interviews were used to determine, from key stakeholders' perspectives, what infrastructure improvements were necessary to enhance the management of water supplies and improve ecological functions within the Bypass. Following study completion, the Project was further refined through a close working relationship with, and a significant commitment of staff resources from, Ducks Unlimited, the California Department of Fish and Wildlife (CDFW), the Yolo Basin Foundation (YBF), Yolo County, and the Metropolitan Water District of Southern California (MWD).

Peer review: This project was awarded funding from the 2015 funding round of the CDFW Proposition 1 Delta Water Quality and Ecosystem Restoration Grant Program. The selection of projects for Prop 1 funding is based upon statute that requires a public process for grant application, review and award. Section 79707(d) of the Water Code pertaining to Proposition 1 funded projects stipulates that "In making decisions regarding water resources, state and local water agencies will use the best available science to inform those decisions". To insure consistency with the statute, and thus the Delta Science Plan, the grant program includes the use of independent science reviewers selected for expertise in science and technical subjects consistent with Grant solicitation priorities. In-house fish and wildlife science expertise at the California Department of Fish and Wildlife is also provided at the request of grant program science staff.

Grant program development is refined for each round of proposal solicitation (annually) consistent with science and technical focus for that round. Coordination with the Delta Stewardship Council, and other state agencies engaged in research and applied ecosystem restoration science, is sought prior to proposal solicitation for grant funding. The intent of such coordination is to insure that projects awarded funding from the CDFW Proposition 1 Delta Water Quality and Ecosystem Restoration Grant Program are, by definition, concordant with the Proposition 1 Statute; Consistent with the Delta Science Plan; and, based upon best available science.

References

California Department of Fish and Game and Yolo Basin Foundation. June 2008. *Yolo Bypass Wildlife Area Land Management Plan*.

Habitat management for migrating and wintering waterfowl in North America, by Smith, Loren. Pederson, Roger. Kaminski, Richard. 1989

California Department of Fish and Game and Yolo Basin Foundation. June 2008. *Yolo Bypass Wildlife Area Land Management Plan*.

Fredrickson, L. H., and F. A. Reid. 1986. Wetland and riparian habitats: a nongame management overview. Pages 59–96 in J. B. Hale, L. B. Best, and R. L. Clawson, eds.

Management of nongame wildlife in the Midwest: a developing art. Northcentral Section, The Wildlife Society, Madison, Wis.

13.4.6. Strategies for Water Level Manipulations in Moist-soil Systems
http://www.nwrc.usgs.gov/wdb/pub/wmh/13_4_6.pdf

Yolo Bypass Drainage and Water infrastructure Improvement Study (2014)
http://www.yolocounty.org/home/showdocument?id=23985

Yolo Bypass Wildlife Area Land Management Plan (2008)
https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=84924&inline